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FIELD TRIALS ON THE USE OF PHENOTHIAZINE AGAINST WORMS IN SHEEP

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The field experiments described below form part of an investigation instituted by the Helminths Committee of the Agricultural Research Council in 1939. In that year the Council purchased a quantity of the drug with the object of testing its anthelmintic value under ordinary conditions over as wide an area as possible. The results of some of these tests were published in the nature of a symposium in the *Veterinary Record*, Oct. 7th, 1940. Summarising their results Taylor and Sanderson (1940) found that the drug in doses varying from 0·25 to 1 gramme per lb. body weight proved almost 100 per cent. effective against stomach worms in sheep. In the small intestine about 80 per cent. of the trichostrongyles were removed, with the exception of *Nematodirus*, on which it appeared to exert little or no action. No action was obtained against liver-flukes or tapeworms, and observations on its effect against worms inhabiting the large intestine were not recorded. Ten grammes of the drug is stated to be an adequate dose in sheep although doses of 20 to 30 grammes are more likely to produce the maximum effect. The tolerance of sheep to the drug was found to be high, 400 grammes causing no ill effect.

PARTICULARS OF PHENOTHIAZINE USED.

Phenothiazine is a fine, lemon-coloured powder practically insoluble in water. It is the parent substance of a number of dyes and was first prepared in 1885, but it was not until 1934 that it came into use as a parasiticide. In that year Campbell *et al.* (1934) showed that it had a high degree of toxicity against mosquito larvae and that it was even more toxic than rotenone, the active killing agent of derris. Experiments recently carried out on the use of phenothiazine against intestinal worms in domestic animals have indicated that it is a valuable anthelmintic and likely to surpass anything that has so far been tried. The drug, however, will not be made available directly to the farmer in this country for several months yet as it is the intention of the Council, and the manufacturers, to have it thoroughly tested before releasing it on a large scale. Unfortunately, the price of the drug at the moment is rather high, being 14s. 6d. for 50 tablets or 10½d. for a 15 gramme dose. There is a possibility, however, that manufacturers may see their way to reduce the price as soon as a demand for the drug arises.

The phenothiazine used in these experiments was supplied in the form of (1) liquid phenothiazine (Phenovis), being a suspension of finely powdered phenothiazine in water containing a dispersing agent, (2) phenothiazine tablets containing 5 grammes of the pure drug. The liquid was administered with the aid of a drenching gun and the tablets with a balling gun to which was attached a rubber tube. The writer found the liquid quicker and more satisfactory to administer than the tablets. Given the assistance of two men, one man to catch and another to hold the sheep, one person in an hour can dose from 150 to 170 sheep with the balling gun and from 230 to 250 with the drenching gun. Moreover, the latter method requires less skill and is more reliable than the balling gun since the tablets, unless they have been freshly prepared, tend to crumble and fall out when coming in contact with the sheep's mouth.

THE AUTHOR'S EXPERIMENTS

EXPERIMENT 1

This experiment was designed to test the effect of a 10 gramme dose of phenothiazine in tablet form on moderately worm-infested lambs. The sheep were grazed on excellent pasture, the stocking being at the rate of five sheep per acre. The lambs were in excellent condition at the commencement of the experiment. The chief reasons for selecting this flock for experiment were that satisfactory weighing facilities were present at the farm and the lambs could be slaughtered locally and a count of the worms made.

On June 5th the flock, consisting of 56 February-born Suffolk and Oxford Cross lambs, was weighed, marked, and divided into two groups of 35 and 21 lambs each. The former was given 10 grammes of phenothiazine each and the latter was kept as a control. Dosing was repeated on July 4th and August 5th, and the experiment was terminated on August 9th when the lambs were sold through the fat market. The fourth stomachs of nine of the dosed group and of ten of the controls were obtained for worm counts. Table I shows the average weight of the lambs at each dosing and Table II shows the species and number of worms recovered.

Table I (Experiment No. 1)

Showing the Effect of a 10 Gramme Dose of Phenothiazine on moderately Worm-Infested Lambs

Date of Dosing and Weighing.	35 Lambs dosed with Phenothiazine.		21 Control Lambs.	
	Average Weight in lbs.	Average Increase in Weight.	Average Weight in lbs.	Average Increase in Weight.
5.6.40	86·5		84·5	
4.7.40	98·2	11·7	96·0	11·5
9.8.40	103·0	4·8	104·0	8·0

Table II (Experiment No. 1)

Worms Recovered from 9 Lambs Dosed with Phenothiazine and 10 Undosed Controls.

	H. contortus.	*Ostertagia* sp.	*T. axei.*	Total.
Treated Lambs	80	1,520	180	1,780
	320	6,520	—	6,840
	220	760	—	980
	20	540	100	660
	100	4,640	—	4,740
	180	2,380	20	2,580
	60	1,200	—	1,260
	300	4,760	—	5,060
	260	3,160	100	3,520
Average	171	2,831	44	3,047
Control Lambs	200	3,500	80	3,780
	60	4,920	—	4,980
	120	2,900	160	3,180
	140	5,500	—	5,640
	40	2,640	20	2,700
	260	3,440	60	3,760
	240	8,580	—	8,820
	100	2,440	120	2,660
	140	1,780	—	1,920
	—	14	—	14
Average	130	3,571	44	3,745

The results are clearly negative as the average weight of the undosed lambs is actually 1 lb. heavier than in the dosed sheep. There is no significant difference between the worm counts, and the only conclusion that can be drawn from this experiment is that a dose of 10 grammes of phenothiazine or 0·1 gramme per lb. body weight had no effect on worms inhabiting the fourth stomach of this particular flock.

It should be pointed out that when this experiment was planned little information was available on the correct therapeutic dose of phenothiazine for sheep. It was generally believed that 10 grammes was sufficient for a lamb aged five to six months. The factor to be taken into account, however, as this experiment shows, is not the age but the weight of the sheep, and in all future experiments with this drug it is well to bear this in mind.

Experiment 2

This experiment concerns a flock of four-year-old Blackface ewes which were in poor condition and showing signs of worm infestation. A *post-mortem* examination of two that had died showed a moderate number of stomach and intestinal worms but a very heavy infestation with *Chabertia ovina* in the large intestine, the numbers recovered being 572 and 623 individuals respectively. In each case the wall of the intestine was greatly thickened and the mucosa swollen and covered with a layer of mucus in which blood could be seen. At one point the worms were so numerous that they appeared in a cluster.

Twenty ewes were drafted out from the flock and divided into two groups of ten each. They were weighed individually and one group was given 50 c.c. of Phenovis liquid which is approximately equal to 20 grammes of phenothiazine or 0·25 gramme per lb. body weight. The sheep were dosed on three occasions at intervals of a month. Table III shows the average weight of each group at dosing.

Table III (Experiment No. 2)

Showing the Effect of a 20 Gramme Dose of Phenothiazine Liquid Administered to Ewes affected mainly with *Chabertia ovina.*

Date of Dosing and Weighing.	10 Ewes Dosed with 20 grammes Phenothiazine.		10 Control Ewes.	
	Average Weight in lbs.	Average Increase in Weight.	Average Weight in lbs.	Average Increase in Weight.
14.7.40	81·1		82·3	
15.8.40	85·0	4·1	85·2	2·9
14.9.40	88·4	3·4	85·3	0·1

The results show that over the period of the experiment the dosed ewes put on 7·5 lbs. per head compared with 3 lbs. per head in the control group, a difference of 4½ lbs. In addition to this increase in body weight, the dosed ewes had a much more vigorous and healthy appearance than the sheep in the control group.

In order to get some idea of the effect of the dose on the worm burdens of the two groups, one ewe from each group was slaughtered and worm counts made. Very few stomach and intestinal worms were recovered from the dosed ewe and only a total of 17 *Chabertia,* while the undosed ewe yielded a considerable number of stomach and intestinal worms and a total of 593 *Chabertia.*

The conclusion to be drawn from this experiment is that phenothiazine at the rate of 0·25 lb. per lb. body weight, administered in liquid form to ewes heavily infested with *Chabertia,* led to a satisfactory recovery in health and weight and gave rise to almost a complete removal of the worms in the large bowel.

Experiment 3

Two ewes, showing advanced symptoms of Chabertiosis, and a condition so poor that they were not expected to recover, were specially selected from the above flock for a large dose of phenothiazine. They were given 30 grammes of phenothiazine in liquid form or 0·5 gramme per lb. body weight on July 15th and again on August 14th. Table IV shows their individual weights and egg counts per gramme of faeces.

Table IV (Experiment No. 3)

Showing the Effect of a 30 Gramme Dose of Phenothiazine administered to 2 Ewes Suffering from Chabertiosis

Date of Dosing and Weighing.	Weight in lbs.	Egg Count per Gramme.	Weight in lbs.	Egg Count per Gramme.
15. 8.40	60	7,400	69	8,600
14. 9.40	72	1,000	81	600
14.10.40	97	400	101	200
Total Gain in Weight, 37 lbs.			Total Gain in Weight, 32 lbs.	

It will be observed that the ewes put on 37 lbs. and 32 lbs. respectively during the two months of the experiment, or an increase of over ½ lb. per day—a truly remarkable recovery. The reduction in the egg counts is also regarded as significant and suggests that the anthelmintic action of the drug at the rate of 0·5 gramme per lb. body weight was highly efficient.

It should be noted that in this and the previous experiment the animals were grazed on the same worm infested pastures so that there is no question of their recovery being partly due to a change of pasture or improved diet.

Summary

(1) Phenothiazine, in tablet form, administered at a dose rate of 0·1 gramme per lb. body weight had no effect on worms inhabiting the fourth stomach of lambs.

(2) Phenothiazine, in liquid form, administered at the rate of 0·25 gramme per lb. body weight to ewes heavily infested with *Chabertia ovina* showed an average increase of 7·5 lbs. per head over a period of two months and a marked reduction in the number of worms.

Given at the rate of 0·5 gramme per lb. body weight to two ewes showing advanced symptoms of *Chabertiosis* an average increase in live weight of ½ lb. per day was obtained for a period of two months and a marked reduction in the egg counts.

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THIRD ADDENDUM TO THE BRITISH PHARMACOPOEIA

Notice is given in a recent issue of the London Gazette that the General Council of Medical Education and Registration of the United Kingdom have published a Third Addendum to the British Pharmacopoeia, 1932, which Addendum is printed as authorised by the said Council by Butler and Tanner, Ltd., of Frome, and of 19, Ludgate Hill, London, E.C.4, and as so authorised is published for the said Council by Constable and Co., Ltd., of 10 and 12, Orange Street, Leicester Square, London, W.C.2.

Robert Von Ostertag

1864-1940

"*Robert von Ostertag ist tot.*" In these German words is announced the death of the eminent veterinarian known throughout the world as a pathologist and expert meat inspector who could justly be called the "Father of meat inspection," for his "Handbuch der Fleischbeschau" was, and still is, used everywhere as the standard work on the inspection of meat.

Little did I think, when I bade him "*Auf Wiedersehen*" in Buenos Aires that I would never see him again, for we had arranged to meet again in Switzerland. Professor Ostertag was, in appearance, a typical German, and to those not priviledged to know him personally, rather stern looking, but to his intimate friends, and I had the honour to be one of them, he was a charming personality. His inability to converse freely in foreign languages, although he could read several of them, made it difficult to become thoroughly acquainted with him and this, with all his great ability, he much regretted. It would take too long to give in full detail his wonderful life of activity: those who desire further knowledge I would refer to the very good article in the *Veterinary Record* of September 1st, 1934, by Dr. Nicholson.

He was, for a short time, in practice with his brother, then—after a period in the Guards Regiment of the Germany Army—appointed first assistant, and later, municipal officer and meat inspector in the Berlin slaughterhouse, continuing his studies under Virchow. At the early age of 27, while professor of meat inspection and contagious diseases, he began the first edition of his famous "Handbuch." This entailed much work in collecting and collating all the possible information he could obtain from all parts of the world, and the careful method he adopted, in conjunction with his own experience, can be seen in the first edition the contents of which show few conditions known to present veterinarians which are not contained therein.

With all his knowledge he was always modest: when I had in many countries met him at veterinary gatherings I always referred to him as our "Father of modern meat inspection," and he always interrupted with the words: "*Nein, Nein*"—he often referred to Walley's first edition on the subject as "*Klein aber sehr gute.*" When we were both asked to speak at such meetings he always put his hand on my shoulder and kindly said: "*Sprechen Sie ersten, mein Freund,*" which, needless to say, I always refused to do. He was proud of his book having been published in English, in the U.S.A., but specially pleased when he was asked to give permission for his latest edition to be translated and published in London, and he spoke in the highest praise of the work performed by Dr. Marshall.

During the last few years of his life Professor Ostertag suffered considerable physical pain due to the loss of one of his feet, but he continued his activities in editing his Journal, "*Fleisch und Milchhygiene.*" Later, he suffered mental pain in observing the relationship between Germany and Great Britain for he was proud of being an H.A.R.C.V.S. His last visit to London was when he attended the International Veterinary Congress, where he was warmly received by all who knew him and delighted beyond measure when he attended the

Reception given by the City Council in the old Guildhall; this he never forgot, and everywhere we met he always referred to that event as the most Regal Reception he had ever seen in any part of the world.

I feel sure he would have been very sad if he had lived to know what his countrymen had done to the historic building where he was so kindly received. Professor Ostertag was always anxious for peace between his country and ours, and when it looked as if there might be war between us I sent to him copies, in the British and German languages, of a letter addressed to the German people by an eminent writer which appeared in the *Daily Mail*. He at once replied, reciprocating the sentiment of the writer. Later, when Mr. Chamberlain made his historic visit to Germany, Professor Ostertag subsequently wrote to Dr. Bullock asking if it would be possible to obtain the autograph of our Premier. This Dr. Bullock, fortunately, was able to do.

Alas, *mein Freund*, we will never see you again, but *malgré* the horrible war existing between your country and ours there are many of us who will long remember you for the good work you did for the veterinary profession, not only in your own country but all over the world.

To Professor Ostertag's relatives we send our deepest sympathies.

T. D. Young,
English Editor of Ostertag's "Handbuch."

Britain's Feeding-Stuffs Gap; Can it be Closed?*

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In a current article the author[1] has attempted to estimate the total supplies of feeding-stuffs which are normally available for the nutrition of Britain's livestock population, and to indicate the probable influence of the war on the origin and volume of these supplies. Briefly, the results show that the total pre-war supplies amounted to about 42 million tons (expressed as dry matter), which provided some 22 million tons of starch equivalent and 3½ million tons of protein equivalent. Of these supplies roughly 75 per cent. were home-produced (about 60 per cent. being derived from grassland), while 25 per cent. were imported from overseas. The imported feeding-stuffs consisted mainly of cereals and protein-rich oilseed products, both of which are particularly important as sources of nutrients for dairy cattle, pigs and poultry.

It is manifestly impossible to forecast the probable reduction in the volume of these imported feeding-stuffs during the war period, but a drastic reduction in the total imports is clearly inevitable. It seems probable, moreover, that this reduction will affect more or less equally the supplies of protein and starch equivalent. It is obviously desirable to determine how far the resulting gap in the country's feeding-stuffs can be closed. Various methods have been suggested for increasing the home-production of nutrients suitable for livestock feeding, as well as for reducing consumption by the more economic utilisation of available supplies. The object of the following notes is to attempt to assess *in quantitative terms* the possible effects of some of the more widely advocated of these methods, and so to gauge the magnitude of the task with which the country is likely to be faced.

*Reprinted from *Agricultural Progress*, Vol. XVII (Part 2). 1940. [Hannah Dairy Research Institute: Reprint No. 107.]

[1] "Britain's Supplies of Feeding-Stuffs." N. C. Wright: *Empire Journal of Exp. Agric.*, July, 1940.

Conservation of Waste Products

Two classes of waste product have been the subject of special consideration since the outbreak of war, namely, slaughter-house offals and kitchen waste.

Meat Offals.—The pre-war output of meat offals suitable for feeding to livestock may be estimated at about 39,000 tons[1]. To this should be added some 3,000 tons of edible blood meal. The efforts of the Ministry of Food are likely to result in the recovery of a larger proportion of meat offals, most of which will be available for animal feeding, and it is probable that such efforts will be favoured by the new system of centralised slaughter. It is questionable, however, whether sufficient attention is yet being paid to the recovery of blood and its conversion into animal food: much of the blood which is at present recovered is only fit for use as a fertiliser, although the high protein content (70 per cent.) and the exceptionally high biological value of the protein make it an ideal concentrate for balancing cereal rations.

It is difficult to gauge the magnitude of the potential supplies from these two sources. In an earlier paper[2] it was estimated that the present output of edible blood meal could be at least doubled, and it is probable that an even greater percentage increase could be made in the output of meat offals. On the other hand, supplies of fish meal are now seriously curtailed, the pre-war estimate of 84,000 tons being already reduced to some 20,000 tons. It is unlikely that the increased conservation of all slaughter-house offals could do more than counterbalance this loss, which amounts to about 34,000 tons of protein equivalent and 37,000 tons of starch equivalent.

Kitchen Waste.—As regards kitchen waste, in typical working class districts the house-to-house collection of refuse would probably yield at least 2½ cwt. per 100 houses per week[3]. On this basis the annual output of kitchen waste from the nine million houses in urban areas in Great Britain would work out at not less than 600,000 tons. There are reasons for believing that this is a conservative figure. An alternative estimate which has recently been quoted[4] places the wastage as high as 1 lb. per family daily, giving an annual output of 1½ million tons.

Owing to its variable composition, it is impracticable to allocate a definite feeding value to such waste. It is probable, however, that (when unmixed with water) its nutritive value lies midway between that of potatoes and of, say, sugar-beet tops[5]. If the waste is assumed to contain 1 per cent. of protein equivalent and 12 per cent. of starch equivalent, and if the more conservative figure of 600,000 tons is used as a basis of calculation, the potential output of nutrients from kitchen waste will be 6,000 tons of protein equivalent, and 72,000 tons of starch equivalent.

[1] This figure is 50% higher than that given for meat meal in the 1935 Census of Production, where the entry is qualified by the statement "so far as recorded separately."

[2] "The Importance of Home-Produced Feeding-Stuffs." N. C. Wright: *Trans. Highland and Agric. Soc.*, 1938.

[3] Estimate obtained from the Ministry of Supply.

[4] "Kitchen Waste for Feeding Farm Stock." John Beharrell: *Nature*, July 13th, 1940.

[5] "Feeds and Feeding Practice for Pigs in War-Time." J. Edwards: *The Pig Breeder's Gazette*, 1940.

GRASS SILAGE

In an earlier article the author stressed the importance of grass conservation, and particularly of the production of grass silage, as the most practicable means of reducing the country's dependence on imported feeding-stuffs. This policy has recently been the subject of intensive propaganda, the officially-stated aim being the production of one million tons of grass silage from the present season's aftermath[1].

Such silage will vary widely in composition, but for the purpose of the present estimate it may be assumed to contain some 25 per cent. dry matter, with a protein equivalent of not more than 10 per cent.[2] and a starch equivalent of about 50 per cent. On this basis the production of one million tons of grass silage would supply 25,000 tons of protein equivalent and 125,000 tons of starch equivalent. The ensiling of this quantity of grass would require the construction of some 30,000 silos, each of 30-35 tons capacity.

It may be noted that the contribution of artificially-dried grass to the nation's feeding-stuffs supplies is virtually negligible, the total output of existing plants amounting to only 15,000 tons[3], containing some 2,500 tons of protein equivalent and 7,500 tons of starch equivalent.

PRE-DIGESTION OF STRAW

In the last war attempts were made in Germany to improve the food value of straw by artificial pre-digestion with alkali and other similar reagents. Work on this subject has recently been undertaken in this country[4], and it has been confirmed that all types of straw can, by suitable treatment, be made to yield a product of greatly increased energy value, though it may be noted that the treated straw contains a negligible amount of protein. The exact starch equivalent of the product cannot yet be stated with accuracy, but an overall value of 45 per cent. may be used for the purpose of calculation. This falls midway between the extreme figures quoted in a recent article[5], *viz.*, 40 per cent. for wheat straw and 55 per cent. for oat straw.

Roughly half the straw at present produced in Britain is assumed to be already utilised for stock-feeding[6]. It would be optimistic to assume that more than 10 per cent. of the remainder, *i.e.*, of that used for litter, thatching, etc., could be subjected to pre-digestion. The 275,000 tons of straw so treated would provide 124,000 tons of starch equivalent. It may be noted that this would involve the use of over 20,000 digestion tanks, and of about 22,000 tons of caustic soda.

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[1]Quoted from *The Farmer and Stock-Breeder*, June 11th, 1940.

[2]According to S. J. Watson (*The Science and Practice of Conservation*, Vol. II, 1939) the nutritive value of silage should be based on the digestible crude protein rather than the protein equivalent. The latter value has been used in the present article in order that all figures should be on a comparable basis.

[3]"Fodder Conservation with Special Reference to Grass Drying." E. J. Roberts. *A.R.C. Rep. Ser.*, No. 5, 1939.

[4]*i.e.*, at the Rowett Research Institute and at Jealott's Hill Research Station.

[5]"Stock Feeding under War Conditions." J. A. Scott Watson: *Trans. High. Agric. Soc.*, 1940.

[6]The author's own estimates are 75 per cent. of oat straw, 30 per cent. of barley straw, and 20 per cent. of wheat straw. The total output of straw of the United Kingdom amounts to roughly 5½ million tons.

SYNTHETIC NITROGEN COMPOUNDS

One further novel source of nutrients merits attention, namely, synthetic nitrogen compounds such as urea and ammonium bicarbonate. While such compounds cannot be directly utilised by non-ruminants, there is evidence that they can successfully replace a considerable proportion of the protein in the rations of both growing and milking cattle. They would therefore be of special value in making good the protein deficiency in cereal foods and other feeding-stuffs of comparatively low protein content.

It is generally agreed that such synthetic nitrogen compounds can be safely used to the extent of about one-third of the protein equivalent of the ration. According to the author's estimates the total protein requirements of the country's dairy cattle amount to 930,000 tons per year. Of this quantity roughly one-eighth, or about 120,000 tons, is normally supplied in the form of cereals. The addition of a supplement of, say, urea sufficient to give a final urea content corresponding to one-third of the protein equivalent of the ration would require an annual urea output of 20,000 tons, or roughly 55 tons per day. It is questionable whether even a fifth of this quantity could be made available for feeding purposes, *i.e.*, an amount equivalent to about 12,000 tons of protein equivalent per year.

CULTIVATION OF BEANS

Beans are one of the few British crops which furnish a meal of relatively high protein content, comparable with imported oilseed products. During the past 60 years there has, however, been a progressive decrease in the area under this crop, which has fallen from nearly 500,000 acres in 1877 to the present figure of about 125,000 acres. It is clearly desirable, at a time when a serious shortage of imported protein concentrates is inevitable, to attempt to increase the bean acreage, but this can presumably be done only at the expense of the cereal acreage. It is therefore necessary, in determining the potential increase in nutrients which might be achieved by increased bean cultivation, to allow for the reduced output of cereals.

An average yield of beans (16 cwt.) will provide 3·2 cwt. of protein equivalent and 10·5 cwt. starch equivalent per acre. The corresponding yield of nutrients from, say, oats, including the straw, would be 1·4 cwt. protein equivalent and 13 cwt. starch equivalent. On this basis, the doubling of the present bean acreage (to 250,000 acres, which was the actual acreage in 1914-18) would increase the supply of home-produced protein equivalent by just over 11,000 tons, but would decrease the starch equivalent by nearly 16,000 tons. The loss of the latter could, however, be made good by a relatively small increase in the potato acreage, on the basis of one-tenth of an acre per acre of beans. A return to the maximum acreage of 1877, *i.e.*, 500,000 acres, would treble the above figures.

ECONOMY IN UTILISATION

Apart from the development of new sources of supply, substantial savings in certain classes of feeding-stuffs could undoubtedly be effected by modifications in the present rationing methods.

Probably the most widely advocated measure is the adoption of the Lehmann system of pig feeding. In this system the meal allowance is never increased beyond 2½ lb. per head per day, and the balance of the animal's requirements is provided in the form of more bulky foods, such as boiled roots, potatoes, swill and green crops. An indication of the resulting saving in cereals and concentrates can be obtained if it is assumed that the overall consumption

of meal is at present 4 lb. per head per day. The adoption of the Lehmann system would thus reduce the daily ration by 1½ lb. On this basis the annual saving of meal for, say, 3½ million pigs would amount to 855,000 tons, which would contain about 120,000 tons of protein equivalent and 600,000 tons of starch equivalent.

This represents a saving of meal but *not* a saving of total nutrients, since the balance has to be obtained either from coarser home-produced foods or from new sources of supply such as kitchen waste.

A genuine saving in nutrients could, however, be effected by the adoption of certain recently revised feeding standards. For example, the earlier standards for dairy cattle included an allowance of 0·6 lb. protein equivalent per gallon of milk. Recent work[1] shows, however, that this can be reduced to 0·5 lb. without adversely affecting the milk yield. On the assumption that the older standard represents the usual pre-war practice, the general adoption of the 0·5 lb. standard would result (in the winter feeding period) in an annual saving of 30,000 tons of protein equivalent. Although no similar saving can be made in the starch equivalent required for milk production, it has been shown[2] that the prevailing maintenance standard of 6 lb. starch equivalent per 1,000 lb. live weight can safely be reduced to 5 lb. The general adoption of this lower standard (again in the winter period) would, on the basis of 2 million cows in milk, result in a yearly saving of 163,000 tons of starch equivalent.

It is more difficult to gauge the potential savings which might be effected in the feeding of poultry. A recent estimate indicates that feeding above the accepted standard[1] is relatively common, and it has been suggested that reductions of 10 lb. and 20 lb. per season could be made respectively in the present rations of table and laying birds. While these are admittedly approximate figures, they are probably sufficiently representative to form a basis for calculating the overall annual savings in nutrients. These will amount in the aggregate to some 72,000 tons of protein equivalent and 360,000 tons of starch equivalent.

[1] "The Feeding of Dairy Cows." J. Mackintosh: *Min. Agric. Bul.*, No. 42 (1938).
[2] "Feeding Standards for Dairy Cows." E. T. Halnan: *J. Dairy Res.*: November, 1929.

General Discussion

New Sources of Supply

In the above notes it has only been possible to deal in detail with those methods which have been most widely advocated for increasing the home production and conservation of feeding-stuffs. The figures which have been quoted will, however, be sufficient to provide a rough indication of the additional nutrients which might be secured by the adoption of such methods. For convenience the figures have been summarised in Table I, the author's published estimates of the total pre-war supplies of feeding-stuffs being also included for comparison.

[1] "The Scientific Principles of Poultry Keeping." E. T. Halnan: *Min. Agric. Bul.*, No. 7 (1934).

TABLE I

Estimates of Nutrients which might be obtained from New Sources of Supply, and of Savings which might be effected by the More Economic Utilisation of Existing Supplies

Source of Supply or Savings	Protein Equivalent (tons)	Starch Equivalent (tons)	Remarks
New Sources of Supply			
Slaughter-house offals	34,000	37,000	Nutrients equivalent to the reduction in the supplies of fish meal.
Kitchen waste	6,000	72,000	Assumed total output of 600,000 tons of crude waste material.
Grass silage	25,000	125,000	Ministry of Agriculture's immediate aim of 1,000,000 tons.
Artificially dried grass	2,500	7,500	Estimated output of 15,000 tons.
Pre-digestion of straw	—	124,000	Pre-digestion of 10 per cent. of straw not otherwise used for stock feeding.
Synthetic nitrogen compounds	12,000	—	Assumed supply equivalent to 11 tons of urea per day.
Cultivation of beans	11,000	—	Assumption that the existing acreage will be doubled at the expense of the cereal crop.
	90,500	365,500	
Savings in Existing Supplies			
Pigs	120,000	600,000	Adoption of the Lehmann system of pig feeding.
Dairy cows	30,000	163,000	Adoption of 0·5 lb. protein standard for production and 5 lb. energy standard for maintenance.
Poultry	72,000	360,000	Adoption of minimum feeding standards.
	222,000	1,123,000	
Total nutrients, all sources	312,500	1,488,500	
Pre-war imports	1,006,000	4,911,000	Author's estimates included for comparison with the above figures.
Pre-war home production	2,672,000	16,693,000	
Total pre-war supplies	3,678,000	21,604,000	

It is not, of course, possible to forecast the extent to which the pre-war imports of feeding-stuffs will be reduced. For the purpose of the present discussion it will be prudent to assume that *no* imports will be available, *i.e.*, that the closing of the feeding-stuffs gap will necessitate the replacement of the *whole* of the pre-war imports with home-produced nutrients. While such a drastic reduction in imports is unlikely,[1] it should be pointed out that other pre-war sources of supply may be curtailed. For instance, it has been noted that the supplies of fish meal have already been reduced by some 60,000 tons, involving the loss of between 30,000 and 40,000 tons of both protein and starch equivalent. Again, one immediate result of the ploughing-up campaign is likely to be a further reduction in the nutrients available for livestock to the extent of from 50,000 to 100,000 tons, while the raising of the extraction rate of wheat to 85 per cent., which has recently been advocated, would involve a still further loss of 100,000 tons of protein equivalent, and as much as 500,000 tons of starch equivalent[1]. In these circumstances it seems reasonable to allow for a possible feeding-stuffs gap corresponding to the total volume of imports, *i.e.*, roughly one million tons of protein equivalent and five million tons of starch equivalent.

The first and perhaps the most striking fact revealed by Table I is the relatively small potential contribution of the new sources of supply. The estimated output of nutrients from all these combined sources represents only 7–9 per cent. of the feeding-stuffs gap. Would it be possible to increase this output ?

It has already been noted that the conservation of slaughter-house offals cannot be expected to do more than make good the reduction in the supplies of fish meal. Actually, the potential output of such offals will inevitably decrease as the country's home meat production is reduced. The same argument applies to kitchen waste, the output of which is likely to fall as the need for conserving human food becomes more urgent.

The increased cultivation of beans has been widely advocated as a means of expanding the home production of protein. A doubling of the existing acreage would bring back the area under beans to the 1912-14 level, yet the resultant increase in the supply of protein would replace only 1 per cent. of the feeding-stuffs imports. Even if the area were to be increased to the maximum (1877) level, the increase in nutrients would still be relatively small. Moreover, it is cogent to point out that during the last war the bean acreage actually showed a decrease, from 275,000 to 300,000 tons in 1912-14 to about 220,000 tons in 1917. It does not therefore appear that the feeding-stuffs gap is likely to be appreciably affected by an increase in the bean acreage. It may be noted that the same general contention holds for other crops which have been suggested as potential sources of supply, *e.g.*, linseed and certain green crops—a fact which finds support in the recently expressed view that " it is impossible to suggest any major alterations in cropping that would be likely to produce substantially larger amounts of the kinds of stock food that are required[2]."

It will be seen from Table I that the utilisation of urea (or of any similar synthetic nitrogen compound) would, on the basis of an assumed daily output of 11 tons, supply a quantity of protein equivalent roughly the same as that obtainable from the doubling of the bean acreage. It is very questionable whether such a large proportion of the home output could be put aside for feeding purposes. On the other hand, weight for weight, the quantity of protein equivalent supplied by a synthetic nitrogen compound such as urea is about ten times that contained in the richest oilseed concentrates. Any shortage in the home production of such synthetic nitrogen compounds might therefore be to some extent made good by allocating a relatively small shipping space to their importation. Even so, however, the overall increase in nutrients would not be large.

It may be noted that the conversion of synthetic nitrogen compounds into yeast fodder would be unlikely to provide more protein than the direct utilisation of such compounds by the ruminant.

The pre-digestion of straw has been widely advocated as a means of closing the feeding-stuffs gap, and it has been claimed that " by utilising all the surplus straw now used for litter, it would be possible to replace half a million tons of imported maize." This latter figure, though numerically large, represents, in fact, a relatively small proportion of the feeding-stuffs imports. It is only one-sixth of the total imports of maize, and only one-sixteenth of the combined imports of all feeding-stuffs. Nevertheless, the claim is sufficiently striking to justify further consideration.

Half a million tons of maize will provide just under 400,000 tons of starch equivalent. To produce the same amount of energy in the form of pre-digested straw, it would be necessary to treat not less than 900,000 tons of crude straw, *i.e.*, about one-third of that at present used for litter, thatching, etc. It is unlikely that such a high proportion could be spared for this purpose. Moreover, even if it could be spared, it would necessitate the construction of nearly 100,000 digestion tanks, valued at not less than £1,000,000, and the use of about 100,000 tons of caustic soda. As regards the tanks, it is difficult to visualise a conservative farming community undertaking capital expenditure of this magnitude on such a novel procedure as pre-digestion ; as regards the caustic soda, it is pertinent to point out that the country's production of *all* forms of sodium salts only amounts to about one million tons, so that the diversion to the process of 100,000 tons of sodium hydroxide might seriously interfere with supplies required for industrial purposes. One further point may be mentioned. The shortage of farm labour is already a matter of concern to the agricultural industry. The pre-digestion of straw (unlike the production of grass silage) would necessitate the daily employment of labour in the processing and washing of the product, and would therefore add materially to existing labour difficulties. Moreover, while the pre-digestion of straw *might* successfully replace a small part of the energy at present supplied by cereals, it would not supply the protein. The substitution of pre-digested straw for imported cereals would therefore lead to a still greater imbalance between protein and starch equivalent than exists at present.

This somewhat detailed discussion of the potential value of pre-digested straw has been included because it illustrates the difficulties which are involved in translating small-scale trials into nation-wide practice. The same argument does not, however, hold in regard to the remaining item in Table I, *i.e.*, grass silage. Silage making in one form or another has been practised in this country for well over 60 years. Grass silage production is, therefore, merely a new application of a process which has already been widely practised by many progressive farmers.

[1] It may be noted that between 1914 and 1918 the supplies of animal feeding stuffs were reduced by about 60 per cent.

[2] " Stock Feeding under War Conditions." J. A. Scott Watson : *Trans. High. Agric. Soc.*, 1940.

The chief modifications from the older technique which form the basis of the present campaign for grass silage production are (*i*) the ensiling of young herbage, containing a relatively high protein content; (*ii*) the control of fermentation by proper filling of the silo supplemented by the addition of certain chemical agents (either acids or molasses or salt); and (*iii*) the use of small and cheap portable silos.

The estimated output of nutrients from grass silage, as quoted in Table I, is based on the Ministry of Agriculture's immediate objective of 1,000,000 tons of aftermath silage. This is presumably an interim measure, for it is clear that a far greater effort would be required to affect appreciably the feeding-stuffs gap. In this connection it will be instructive to ascertain how far, say, a tenfold increase in the present objective (*i.e.*, a total production of ten million tons) might be feasible.

As regards the ability of the existing grassland acreage to supply the requisite herbage, the production of ten million tons of silage would necessitate only a 10 per cent. increase in the present yields. Such an increase could be attained without difficulty by the adoption of the improved methods of grassland management. Moreover, even if an actual increase were not in fact attainable, there would remain the alternative of so reducing the summer grazing requirements (by a reduction in the livestock population) that part of the present output of grass herbage could be converted into silage, and thus be used to redress the present imbalance between the summer and winter feeding-stuffs supplies. As regards the provision of silos, an output of ten million tons would require about 300,000 silos, each of 30 to 35 tons capacity. There are roughly 100,000 agricultural holdings of 150 acres and upwards in the United Kingdom, so that silage production on the above scale would involve the acquisition, on the average, of three silos per holding. It would clearly be over optimistic to anticipate such a large increase in the production of silage at an early date; but in a time of really serious emergency, an extension of silage making on this scale ought not to be ruled out as impracticable. It may be noted that ten million tons of silage would provide 250,000 tons of protein equivalent and one and a quarter million tons of starch equivalent, *i.e.*, about a quarter of the present imported nutrients.

Utilisation of Existing Supplies

It has been stated that the most striking fact revealed by Table I is the relatively small part played by new sources of supply in closing the feeding-stuffs gap. Almost equally striking is the relatively large contribution which could be made by the more economic utilisation of existing supplies. The estimates of savings are admittedly very approximate, and it is possible that the figures for the individual classes of stock are, in some instances, too high. On the other hand, the estimates do not include savings which could be effected in the feeding of beef cattle and sheep, nor do they cover indirect savings, which would result from the selection and preferential feeding of high yielding and early maturing stock. It is therefore probable that the *total* estimated savings are not exaggerated.

According to Table I, these savings represent roughly three times the nutrients which are likely to be secured from new sources of supply. In order to bring home the importance of such savings in comparison with the potentialities of increased production, a single example may be quoted. It will be seen from Table I that the Ministry of Agriculture's aim of 1,000,000 tons of grass silage would provide 25,000 tons of protein equivalent and 125,000 tons of starch equivalent. The general adoption of the revised standards for dairy cattle would alone achieve savings considerably in excess of these quantities, *viz.*, 30,000 tons of protein equivalent and 163,000 tons of starch equivalent. Such savings would, moreover, be achieved without any expenditure on either capital or production costs. The estimated savings in the feeding of poultry are even higher, though these are inevitably difficult to assess with any degree of accuracy. The savings in pig-feeding are of a somewhat different character, *i.e.*, they do not represent savings in total nutrients (the lowered meal allowance being made good by feeding bulky home-produced rations), but they *do* represent definite savings in imported cereals and concentrates.

The above facts should not detract from the urgency of seeking for and developing new sources of supply. If the feeding-stuffs gap is to be closed, it is clear that *every* possible means, both of increasing and of conserving the country's feeding-stuffs must be employed. Nevertheless it is essential, in attempting to close the feeding-stuffs gap, to ensure that the energy devoted to each line of attack is commensurate with the results likely to be achieved; that is, to preserve a sense of proportion in deciding how far the country's efforts should be concentrated in this or that direction.

Up to the present, emphasis has been laid almost entirely on achieving increased *production*. No corresponding effort has been made to encourage the more *economic utilisation* of existing supplies. The co-operation of agricultural colleges and industrial firms has, for example, been secured in an intensive campaign to stimulate the production of grass silage. Yet no similar co-operative attempt has been made since the outbreak of war to instruct farmers in the technique of war-time stock feeding, though this would appear to be not only a far easier but actually a more important task.

The policy so far adopted has, in fact, merely been to limit the purchase of feeding-stuffs by releasing an arbitrary percentage of the previous year's consumption *without reference to the economy of utilisation on the individual farm*. This policy is likely to result in an entirely inequitable distribution of available supplies, since the amount allocated to the progressive farmer, who has fed his stock during previous years on a strictly rationed (and therefore a minimum) basis, is naturally inadequate, while the quantity available to the farmer who has not previously adopted any satisfactory rationing system (and who has therefore probably been over-feeding) is sufficient to cover the essential requirements of *all* his stock.

It is clearly necessary that such an anomaly should be rectified, and that the most efficient utilisation of all available supplies should thus be ensured. It is an open question whether this can be achieved by voluntary means (*i.e.*, by an extension of the existing advisory services) or whether compulsory rationing will need to be introduced.[1] The point of immediate importance is, however, to recognise the magnitude of the potential savings which *could* be effected by appropriate action, and to ensure that such action is taken without further unnecessary delay.

[1] A first step in this direction has been taken by specifying the ingredients of rations in the Compound and Mixed Feeding-Stuffs (Control No. 2) Order. A *maximum* saving in feeding-stuffs can, however, only be secured in the long run by the organisation of a definite rationing scheme based on the needs of individual farms, and on the requirements of individual classes of stock.

CLINICAL COMMUNICATIONS

Probable Sodium Silicate Poisoning in Heifers

N. S. BARRON, F. GRIMBLEBY AND G. TAYLOR

Thirty-five yearling heifers, mostly of the Shorthorn breed, were pastured out in a large 100-acre park some distance from the farmstead. The only food available was rather poor quality grass and large quantities of acorns and horse chestnuts. The water supply consisted of a broad, shallow running stream cleared of vegetation during the summer.

On Sunday, October 20th, the owner paid one of his periodic visits to the park and found one animal dead and several sick.

Symptoms

On October 21st two further animals were dead and several more sick. The latter had lost condition rapidly; the coat was staring, the eyes sunken and the belly tucked up. Respirations were shallow and slower than normal, the temperature was raised a little, being 102-102·5° F. and scouring was marked, pale-brown fluid sometimes containing blood clots being constantly discharged.

Sick animals tended to stand about aimlessly or lie down and isolate themselves in a corner. The duration of the illness was from 24-48 hours.

Post-mortem Appearances

In the first instance a *post-mortem* examination was made on the premises but the next day five animals were examined at the slaughterhouse. The lesions found in the latter were uniform and similar to those found in the first animal with the exception that it showed pneumonic lesions with a considerable quantity of fibrinous fluid in the pericardial sac. On removing the skin a vast number of small haemorrhagic points were observed throughout the subcutaneous tissue, the blood appearing unusually dark.

Thorax

Lungs.—Slightly congested.

Heart.—Petechiae and ecchymoses on myocardium, more especially along the lines of division of the cavities and on the surface of the left ventricle.

Pleura.—Blood splashings, varying in intensity in the different animals.

Abdomen

Blood-stained fluid was present in considerable quantities and the serous surfaces showed marked petechiation.

Rumen.—Localised areas of congestion. Rumen contents contained portions of acorns.

Reticulum.—Localised areas of congestion.

Abomasum.—Intensely inflamed, the mucous membrane being a deep magenta colour, greatly swollen and gelatinous.

Small intestine.—Varying degrees of inflammation present throughout its length.

Caecum.—Patches and streaks of intense inflammation. Blood clots could be wiped off the surface in some parts.

Rectum.—Marked congestion. The contents of the alimentary tract from the abomasum to the rectum smelt strongly of ammonia.

Liver.—Congested.

Kidneys.—Pale and enclosed in a soft gelatinous mass permeated with blood.

Lymphatic glands.—Some nodes slightly congested and softer than normal, but generally no change.

Diagnosis

In the first instance and consequent upon the first *post-mortem* examination a tentative diagnosis of haemorrhagic septicaemia was made, notwithstanding the absence of any form of dyspnoea, oedema of the throat or the limited rise in temperature. After the five animals had been autopsied the possibility of acorn poisoning or an anaerobic infection was considered, though the very severe scouring, which lasted to the end, would have been exceptional in the case of the former. At no time had the animals shown any tendency to become constipated.

Suitable material was removed for laboratory examination. No organisms of any pathological significance were found in the tissues nor any toxins of the *Welchii* group lethal to mice, in the bowel contents. In the absence of any positive findings the possibility of poisoning had to be considered, and with this in mind a further visit was made on October 25th. More animals had died and two were very ill.

One of these was killed and examined immediately following slaughter. The result was remarkable in that, apart from the intestinal tract, which showed the changes already described and whose contents also gave off a strong ammoniacal odour, there were no lesions whatsoever.

Material was removed for chemical examination which gave the following result :—

Chemist's Report

"The fluid taken from the abomasum contained blood and possessed a very strong smell of ammonia.

"The most impressive feature revealed by an examination of the contents of the reticulum of the heifer killed on October 25th was the extremely high content of 'Insoluble Ash.' This was found to be silica, and an examination showed that most of it was non-crystalline and also structureless, *i.e.*, it was neither mineral silica (quartz) nor of plant origin. Actually it resembled precipitated silica.

"This fact taken together with the strong alkaline reaction of the abomasum contents, suggested that sodium silicate ('water-glass') might be responsible for the condition. Sodium silicate is hydrolysed in solution to sodium hydroxide, a very strong, caustic, alkali, and silicic acid, a very weak acid. The gelatinous condition of the stomach membrane is a further indication of the presence of caustic alkali. An approximate estimation of the quantity of sodium silicate in the reticulum, calculated from the silica content, would be equivalent to 40 grammes of caustic soda.

"Sodium was found in some quantity in the fluid from the abomasum. It is difficult to attach much significance to this as sodium would normally be present here, and owing to the infiltration of blood in this particular case, the content of sodium would be rather higher than normal.

"Fragments of acorn were found in the stomach contents. A test for tannic acid gave, as would be expected, a positive result."

EXPERIMENTAL.

Two rabbits each about 2·25 kilogrammes in weight were given 7 grammes of waterglass by stomach tube. This is equivalent to 2 grammes per kilo body weight.

No. 1.—Appeared drowsy in four hours, very ill in seven hours and dead within 18 hours.

Post-mortem appearances:—

Thorax.—There was little of note. The auricles were dilated.

Abdomen.—Stomach distended and surface vessels congested. Intestines tympanitic and containing very little ingesta.

Spleen contracted to about 1/5th normal size.

No. 2.—One dose produced no effect so it was repeated. The rabbit then died within 24 hours.

Post-mortem appearances:—

Thorax.—A quantity of blood-stained, oedematous tissue was present anterior to the heart. The auricles were dilated. Extensive haemorrhage had occurred in the musculature of the diaphragm.

Abdomen.—A quantity of blood-stained fluid was present. The mucous membrane of the stomach was deeply congested and in some parts showed extensive haemorrhage. The contents were alkaline to litmus and smelt faintly of ammonia.

Haemorrhagic patches were present in the serous coat of the caecum.

The omental and mesenteric fat was infiltrated with blood.

The above experiments indicate the variable susceptibility of the rabbit to waterglass. The lesions observed in case No. 2 closely resembled those found in the heifers.

We should like to express our thanks to Dr. F. J. Dyer of the Institute of Pharmacology for his collaboration and for carrying out the feeding experiments.

DISCUSSION

Following the first visit the owner moved all the heifers to another pasture. Altogether 13 animals died, including the one killed. The severity of the outbreak was markedly reduced within three days of moving the stock and no further cases occurred after a week, indicating that the source of contamination was associated with the park. Unfortunately it has not been possible to date to discover the origin of the sodium silicate. Young heifers are notoriously inquisitive and might have found tins of waterglass discarded from one of the few premises surrounding the park or waste egg preservative may have found its way into the stream. Analysis of the water, however, revealed no abnormalities. Any contamination which might have occurred would have been of a temporary nature.

The extensive petechiation in those animals which died and the absence of it in the one killed is a striking feature of the case. Such lesions are generally found associated with acute conditions, more especially those of virus origin or due to one or other of the *Welchii* toxins. In the absence of any of these, their existence calls for comment. Possibly the explanation is to be found in the fact that sodium silicate or its decomposition products, after absorption damage the capillary walls to such an extent that their permeability is increased even to protein. This would take place if histamine or histamine-like substances were liberated from the damaged tissues. That this occurred is indicated by the extensive haemorrhages observed in the omentum and kidney fat and elsewhere.

Though the authors have not been able to discover records of the poisoning of stock by sodium silicate, either because they are rare or because this substance is only dangerous in large doses, Lander records a case in which a horse died after receiving 2 drachms of caustic potash.

In the case above described we submit that the evidence presented strongly suggested that a silicate, probably sodium silicate, was the cause of death in the heifers.

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Pre-Natal Anaplasmosis

J. L. STEWART, M.C., B.SC., M.R.C.V.S.

PONG TAMALE, NORTHERN TERRITORIES, GOLD COAST

At Pong-Tamale farm, a calf was born in the early hours of November 17th, 1940, and appeared quite normal. By 9 a.m. the calf was looking somewhat ill and it died in the evening.

On autopsy, the typical lesions of gall sickness were found and *Anaplasma centrale* was found on microscopic examination of the blood. The dam's blood was examined on the following day, when *Anaplasma centrale* was present. The cow was quite normal and exhibited no clinical symptoms whatsoever and is still healthy.

This must be a case of pre-natal infection—which, according to the textbooks, has not been reported.

As a result of this case, all cows' bloods are being examined from a month before calving and in the event of anaplasms being found, it is proposed to treat with "theilerine," a French preparation which has been found effective.

DRUG SUPPLIES IN WAR-TIME: NEW PRODUCTS BY BRITISH CHEMISTS

Mr. Arthur Mortimer, Secretary of the Wholesale Drug Trade Association and Chairman of the Pharmaceutical Export Group, in a paper on "Drug Supplies in War-time" at a meeting of the Pharmaceutical Society on January 16th, said that British chemists were playing a useful part in manufacturing products which before the war were made exclusively in hostile countries. Foreign-owned patents for many substances which had important therapeutic properties had proved a serious handicap to manufacturers in this country, but many of these substances were now being produced by British manufacturers under licences granted by the Comptroller of Patents. The addendum to the "British Pharmacopoeia" which had just been published contained monographs on some of these preparations which in the past had been sold in this country under registered trade names; the Pharmacopoeia Commission had given them new names and it was expected of prescribers that they would use those pharmacopoeia names and not the proprietary ones.

"There was no call upon British subjects to perpetuate the goodwill in enemy trade names and the Government naturally expected that ever British pharmacist throughout the Empire would refuse to keep enemy trade marks warm." It was also important that British exporters should supply to their customers abroad the products which were now being made in this country under designations official in the "Pharmacopoeia."

ABSTRACTS

[SOME IMPORTANT DISEASES OF CATS. DE TIENNE, T. A. (1940.) *N. Amer. Vet.* **21**. 419.]

The author notes the frequency of the syndrome—vomiting, diarrhoea, death—among feline patients; also the necessity in view of the therapeutic preparations now available, of an early specific diagnosis between the diseases usually associated with these symptoms, *i.e.*, specific enteritis, the abdominal type of feline distemper, and coccidiosis.

The first two are usually presented for treatment with similar histories of sudden onset, lassitude, vomiting and high temperature. Points of difference are the higher temperatures (107° to 108°) usually found in specific enteritis, and the profuse watery or bloody diarrhoea present in the abdominal type of distemper and coccidiosis.

Specific enteritis responds very satisfactorily to the simultaneous administration of 10 c.c. of homologous serum intraperitoneally, and 10 c.c. of mixed infection (feline) serum subcutaneously, together with sulphanilamide orally, provided the patient is seen early while the temperature is high. When the temperature has started to fall around 103° the prognosis is grave and serum is less effective. It is essentially a short and violent disease, the main symptoms being hyperpyrexia and collapse.

In the abdominal type of distemper the use of infectious enteritis serum is only moderately effective, this indicating the dual nature of the diseases. The condition in its later stages may show progressive emaciation, nasal and lachrymal discharges, and oral ulceration. It is more difficult to handle than enteritis and treatment must be symptomatic.

Coccidiosis resembles a mild form of the above, but may be diagnosed by demonstration of Isospora in the faeces or vomitus. Occasionally an acute coryza is produced. Treatment in all cases is by the use of ¾ to 3 grains of carbasone daily for five days, which cures 8 per cent. of the cases, but leaves no immunity.

Stray dogs and cats are the probable carriers and disseminators of the disease.

Other less important parasitisms in cats include hook-worms, treated with 4-grain capsules of iron and ammonium citrate twice daily for about two weeks; ascariasis, treated with three ½ grain tablets of calomel and santonin on alternate days, and tapeworm, treated with nemural.

Septic abscess following bites is another universally encountered condition in feline practice, due to the resident oral saprophytes of the cat. Early stages respond well to deep X-ray therapy; in the later stages incision and drainage is greatly assisted by the use of 50 per cent. urea solution in tragacanth jelly, while tissue regeneration is hastened by the use of a solution of bismuth violet.

Multiple cutaneous abscesses and suppurative arthritis are treated with varying results, by the use of suitable bacterins after the causal organism has been identified.

A. E. K.

* * * * *

[INFECTIOUS FELINE AGRANULOCYTOSIS. LAWRENCE, J. S., SYVERTON, J. T., SHAW, J. S., and SMITH, F. P. (1940.) *Amer. J. Path.* **16**. 333.]

Infectious feline agranulocytosis is a disease of cats characterised by leucopenia and pronounced neutropenia. The causal agent is a virus (studies of the virus and bacteriology of the condition are to be reported later).

The incubation period is about five days. The symptoms may vary from listlessness, or inappetence, to vomition, diarrhoea and nasal and ocular discharges. Death may, however, occur without any premonitory symptoms. Recovery takes about five or six days and the first sign is the ingestion of food. The authors estimate mortality to be about 66 per cent.

Detailed studies of the leucocytes were made on 83 cats, and counts were made on the white blood cells of 30 other cats sufficient to reveal the presence of leucopenia and neutropenia.

Two types of response were shown by the leucocytes. In the first group the total white cells and the absolute number of polymorphs gradually diminished from a few days after exposure to the virus until the height of the disease. In the second group the total white cell count diminished little for the first six days and the percentage of polymorphs rose so that their absolute number became nearly the same as the total white cell count. At this stage there was a sudden drop in the total white cell count, even to zero. The mortality was higher in this latter group. There was no thrombocytopenia and no appreciable anaemia.

The bone marrow showed marked hypoplasia at the height of the disease, and a striking feature of the pathology of the condition was the rapidity with which changes occurred in this tissue. The chief tissue changes were necrosis and proliferation, with the presence of inclusion bodies (Type A Cowdry), particularly in the intestinal mucosa and haemopoietic tissues.

The disease is very similar to human agranulocytosis.

D. L. H.

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[OBSERVATIONS ON *TORSIO UTERI* IN CATTLE. KIND, G. G. (1939.) *J. S. Afr. V.M.A.* **10** (3). 126-129.]

A method of correcting torsion of the uterus by rolling is described which appears to differ little from that in general use.

Even in slight cases of torsion in which the hand and arm can be passed into the uterus with ease manual rotation of foetus and uterus is not advised.

The cow is cast, on a slope if possible, with the hind quarters uphill. One man steadies the head. Ropes are applied to the two fore and two hind limbs (fore and hind limbs should not be roped together as this may cause pressure on and tend to fix the uterus). The cow is then pulled quickly in the direction of the torsion so that she comes to rest with a jerk. No attempt is made by the operator to fix the uterus by a hand *per vaginam*. If the torsion is not corrected the cow is rolled back again in a series of jerks but not so as to come to rest suddenly as before. This is repeated until the desired result is obtained.

The cow is not allowed to rise but is calved immediately, the cervix being dilated if necessary.

J. A. L.

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[EFFECTS OF PASTEURISATION TEMPERATURES ON *BR. ABORTUS* AGGLUTINATION IN MILK. TODD, F. A., and RANNEY, A. F. *Vet. Bull.* (1940.) **34**. 31.]

It is recognised that while the blood of the newly born calf is invariably negative to serological tests for *Br. abortus*, calves fed on infected milk later give a transient positive reaction due to the direct absorption

of agglutinins. In three herds, including one certified Bang's disease free, several positive reactions occurred among young stock and it was significant that in all the herds the common factor was the feeding of pasteurised skim milk bought from a co-operative creamery.

Investigation revealed agglutinins in the milk, in one case to a titre of 1 : 50. It was further noted that in a series of milk samples from reacting cows, pasteurisation temperature did not alter the agglutination titres, but that after subjection for 30 minutes to a temperature of 164° F. samples previously having a high agglutination titre now showed practically no agglutination.

Nine composite samples of milk from co-operative dairies revealed seven positive agglutination reactors.

A. E. K.

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[**CONTRACTION OF THE FLEXOR TENDONS.** Frank, E. R. (1940.) *N. Amer. Vet.* **21**. 345. (7 photographs).]

The author finds that congenital contraction of the flexor tendons is most common in mule colts. In the congenital type, he advises splinting the limb when the superficial flexor is affected, but in contraction of the deep flexor, tenotomy followed by splinting of the limb is usually necessary. Tenotomy is also used in all cases of contraction of the acquired type in older animals. The operation is performed in the usual manner but a local anaesthetic alone is used. It should be noted that when the deep flexor is affected, the animal stands on its toe or in grave cases stands on the anterior surface of the fetlock joint. When the superficial flexor is contracted the fetlock is flexed but the foot can still be placed flat on the ground.

J. W. D.

REVIEW

[**DISEASES OF POULTRY: Their Aetiology, Diagnosis, Treatment and Control, with a Section on the Normal Anatomy and Physiology of the Fowl.** By Ernest Gray, M.R.C.V.S., F.R.S.M. pp. 198. 39 illus. (London: Crosby Lockwood & Son, Ltd. Price 9s. 6d.]

The object of producing this book has evidently been to present to the reader the author's ideas and opinions on the methods of disease control in poultry. The book cannot be said to be an exhaustive treatise on the subject. The author has attempted to explain the principles upon which depends the well-being of poultry and in order to do so has entered into discussions concerning immunity, hygiene, effects of sanitation, etc. Unfortunately, in several places errors have crept into this work. There has been apparently a tendency to generalise in connection with even the normal structures of the fowl, assuming that they are similar in detail to those of mammals. Some of the diseases are well described but, concerning others, the author has laid stress upon theories of his own rather than on those supported by experimental evidence. There are also a number of inaccurate statements.

This semi-popular work does not lend itself to review from a scientific aspect. To the poultry keeper who wishes to understand more fully the "whys" and "wherefores" of health and disease problems in poultry it may be of some value. We cannot, however, recommend it to the veterinary profession.

NOTES AND NEWS

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Jan. 28th.—Meeting of the Editorial Committee, N.V.M.A., at 36, Gordon Square, W.C.1, 11 a.m.

Jan. 31st.—Meeting of the Royal Counties Division, N.V.M.A., at Reading, 2.30 p.m.

Feb. 6th.—Central Veterinary Society: Council Meeting 11 a.m.; Annual General Meeting 12 noon; Ordinary General Meeting 2 p.m.—all at the Palmer Hall, West Street, Reading.

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Evacuation of Children: Australian Veterinary Association's Co-operation

Closely following our recent intimation that the Ontario Veterinary Association are pressing on with their arrangements for accommodating the children of veterinarians from this country, in preparation for the resumption of evacuation overseas, we are indeed glad to be able to inform our readers that the National Veterinary Association has received from the Australian Veterinary Association an earnest expression of its desire to participate in this humane enterprise. The offer and invitation were cabled in the following terms: "Australian Veterinary Association welcome opportunity assist children veterinarians evacuated Australia.—Edgar, *Secretary*." The scheme—thus rendered Empire-wide—is sponsored jointly, at the centre, by the Royal College and the "National" and, needless to say, both bodies welcome most appreciatively this further practical evidence of the readiness of our colleagues in the Dominions to safeguard the youngest generation and thus relieve a number of Homeland veterinarians of much anxiety. Enquiries should be addressed to the General Secretary, N.V.M.A., 10, Bore Street, Lichfield, Staffs.

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The Cattle Diseases Campaign

As we have recorded in these columns since the issue of Section 1 of the Report of the N.V.M.A. Survey Committee, every effort has been made, by conference and interview, to further the implementing of the recommendations made therein for the control of diseases of cattle. We understand that, on Wednesday last, the President (Mr. H. W. Steele-Bodger) had a long interview with Mr. C. Nathan and Mr. D. A. E. Cabot (Chief Veterinary Officer, and was pleased to find such a large measure of agreement between the views of the Animal Health Division and those of the N.V.M.A.

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TELEPHONIC COMMUNICATION

Members who are experiencing difficulty in making calls to their clients, or whose clients find it difficult to communicate with them by telephone, are asked to send full particulars to The General Secretary, N.V.M.A., 10, Bore Street, Lichfield, Staffs, *without delay*. This information is required to support representations which have been made to the Postmaster General.

R.C.V.S. OBITUARY

Banham, George Amos, Waterlooside, Banbury Road, Stratford-on-Avon, Warwickshire. Graduated London, April 5th, 1876; Fellowship July 22nd, 1881. Died January 12th, 1941; aged 87 years.

Clunes, Frederick Lawrence, 8, King Street, Hereford, Capt. late R.A.V.C. Graduated London, May 20th, 1892. Died January 14th, 1941, aged 70 years.

Reid, William S., 35, Pembroke Crescent, Hove, 3, Sussex. Graduated London, January 5th, 1884. Died January 7th, 1941, aged 78 years.

Mr. George Amos Banham, F.R.C.V.S.

In recording the death of Mr. George Amos Banham we mourn the loss of one to whom, in an early issue, we hope to pay full tribute as a practitioner who laid this Association under a lasting debt of gratitude. For it was he who, in 1881, in collaboration with J. N. Steel and, as it has been truly expressed in another place, "under the wing of George Fleming," set the first foundations of the "National," the first annual general meeting of which was held in 1883.

Mr. Banham, who was First FitzWygram Prizeman in 1876, took over Mr. Sparrow's practice at Cambridge in 1881. After "settling down" he immediately threw himself into the far-sighted enterprise with John N. Steel and officiated, until the year 1890, as the secretary of the body which was the precurser of the National Veterinary Medical Association. His name will always be associated, too, with the production of what has been described as the most useful book in the senior student's possession or in the veterinarian's library—the "Veterinary Posology," in the later revised editions of which he had as his collaborator Mr. W. Jackson Young, who passed away in June of last year—four years after they had seen issued the sixth revised edition of their work, the title of which but inadequately indicates its scope.

Mr. Banham, who was a past Vice-President of the Royal College of Veterinary Surgeons, and for many years a member of Council and an Examiner, carried on a highly successful practice at Cambridge until, in 1923, he retired and took up residence at Stratford-on-Avon.

He was a life member of the Victoria Veterinary Benevolent Fund, and as a Trustee of the Page Wallis estates, was instrumental in obtaining for the Fund a legacy of £3,000. Though frail in appearance, he was very robust and enjoyed good health until a week before his death. The sympathies of the profession go out to his son, Capt. G. F. Banham, who is in practice in Stratford-on-Avon.

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UNIVERSITY OF LONDON EXAMINATIONS IN VETERINARY SCIENCE

The following is the Pass List (December, 1940) for the Second Examination (Part II), University of London: French, Thomas Henry, Holland, Ernest Henry, and Robins, John Harold, all of the Royal Veterinary College. The Pass List for the B.Sc. (Veterinary Science) Examination is as follows: Beament, Robert Alfred Arthur, and Ticehurst, Robert Edward—both of the Royal Veterinary College. Harries, Leslie Gwyn, of the Royal Veterinary College, has passed in one of the two parts of the examination.

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FOOT-AND-MOUTH DISEASE

Britain Bans Irish Cattle

The landing in Great Britain of cattle, sheep, pigs and goats from Eire, Northern Ireland, and the Isle of Man has been prohibited until further notice.

It was stated on behalf of the Eireann Government that the Department of Agriculture, Dublin, had been officially informed by the British Ministry of Agriculture that the decision had been made owing to an outbreak of foot-and-mouth disease in Co. Derry, N. Ireland. "This decision," says *The Times*, "has caused surprise in Eire, where there is a clean bill of health. Northern Ireland cattle do not pass through Eire ports."

. . . . .

On Sunday last the existence of foot-and-mouth disease was confirmed among cattle at Harefield, Middlesex.

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Another step in improving credit facilities for farmers was announced, recently, by the Ministry of Agriculture. About 300 liaison officers have been appointed by the clearing banks in England and Wales to discuss with county agricultural executive committees any cases of difficulty in regard to farmers' loans. The Ministry states that the Government's promise that the present policy of guaranteed prices and markets together with adjustments will be continued for at least a year after the end of hostilities should create a background of confidence that will encourage both lender and borrower.

CORRESPONDENCE

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

The views expressed in letters addressed to the Editor represent the personal view of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

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FUND FOR RED CROSS AND VETERINARY CHARITIES

To the Editor of the Veterinary Record.

Sir,—I enclose a further list of contributions to the fund which bring the total amount collected to £31 10s. 0d.

	£	s.	d.
P. R. Turner	3	4	0
A. L. Sheather	1	1	6
	£4	5	6

The two contributions above have been made to the Victoria Veterinary Benevolent Fund.

It would seem that all veterinarians who possessed medals or other gold and silver articles have now either given them towards the above Fund or have sold them for various charities or for the purchase of Defence Bonds or other securities. The above Fund has received at most 10 per cent. of the medals awarded since 1918 and one can therefore assume that the remaining 90 per cent. have been devoted to the other purposes mentioned. Or can it be that there are still some tucked away in spite of the urgency of the times? This is my fifth and last appeal and the Fund will be closed at the end of February, which leaves ample time for searching for those mislaid treasures.

Will anyone offer to contribute pound for pound to any additional funds which can be raised from the sale of medals surrendered between now and the last day of February? A maximum could be fixed according to the donor's resources and goodwill.

Yours faithfully,

E. G. White.

Research Institute in Animal Pathology,
Royal Veterinary College,
"The Beeches,"
Streatley, Berks.
January 20th, 1941.

STANDARDISATION OF BIOLOGICAL PRODUCTS

To the Editor of the Veterinary Record

Sir,—The correspondence between Mr. W. T. Rowlands and Mr. H. E. Harbour writing jointly, and Mr. Hall Masheter, dealing with the standardisation of biological products, provides food for serious thought for all members of the profession. *Prima facie* it would appear to be of interest only to the practitioner as the one mainly concerned with the dispensing of these products; but, as it embraces the whole problem of diagnostic, prophylactic and therapeutic medicine, its importance will, I am sure, be appreciated equally by those members holding whole-time appointments.

The reply in the *Veterinary Record* of January 4th is, of course, unsatisfactory, but in all fairness, it must be conceded that any amplification might not serve to maintain the present good relations between the profession and manufacturers, and could quite easily heap trouble on the heads of the authors. The last paragraph, and more particularly the last sentence of their letter, *viz.*, " Are we as a profession, moreover, too weak to demand official control and standardisation, which would undoubtedly be welcomed by most producers," does, however, strike a chord which undoubtedly has been vibrating in the minds of members for a considerable time. One has only to call to mind the feelings of misgiving which abounded with regard to the relative potencies of different brands, and even batches of the same brand of tuberculin, to acknowledge that Messrs. Rowlands and Harbour have taken up a subject which should and must be tackled by " certain responsible authorities."*

I see no reason why there could not be set up a sub-committee of the R.C.V.S. which could undertake the compilation of a list of veterinary products (other than those appearing in the B.P.) of acknowledged therapeutical value, or why this could not be done by the existing Committee of the N.V.M.A. Standards and strengths could be laid down together with a description of the methods and tests by which these are estimated. Such a compilation need have no official status, although it would be better if this were possible, but would be recognised within the profession as containing a list of reliable products.

Firms who wish their preparations to appear in this *Veterinary Codex* would be required to reach the standards laid down, and their appearance or non-appearance in it would be a criterion of efficacy. Such a step, I am sure, would meet with the approval of manufacturers who would have the satisfaction of knowing that if their products appeared in the *Codex* then they would have the confidence of their veterinary clients, and ultimately of the farming community. Moreover, it would rule out the unsatisfactory and often disastrous method of practitioners having to test out preparations by trial and error. This latter should be strictly the concern of the research worker, and should have no province in practice. One can contemplate, for example, what a sorry state of affairs would exist if some of the inferior brands of lamb dysentery sera tested by Messrs. Rowlands and Harbour were to be used this spring. In an area such as North Wales where lamb dysentery abounds, to say the least of it, it would imply a further cut in the meat ration in the near future.

Section 1 of the Report of the Diseases of Farm Livestock by the Survey Committee has now been published. If the excellent recommendations of this report are put into practice, one can well imagine the drug market being flooded with all kinds of preparations, the vendors of some of which will, as has been done hitherto, make the widest claims for them. The present moment would, therefore, appear to be most opportune for setting in motion some scheme to deal with a matter which is of real import to the profession.

Yours faithfully,
J. N. Bowen.

Siamberwen,
Llangollen.
January 13th, 1941.

*This matter is being investigated by the Agricultural and Medical Research Councils.—*Editor.*

DISEASES OF ANIMALS ACTS, 1894 to 1937, and AGRICULTURE ACT of 1937 (PART IV)

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period.	Anthrax.		Foot-and-Mouth Disease.		Parasitic§ Mange.		Sheep Scab.	Swine Fever.	
	Outbreaks confirmed.	Animals attacked.	Outbreaks confirmed.	Animals slaughtered as diseased or exposed to infection.	Outbreaks confirmed.	Animals attacked.	Outbreaks confirmed.	Outbreaks confirmed.	Swine slaughtered.
	No.	No.	No.	No.	No.	No.	No.	No.	No.
Period 16th to 30th Nov., 1940	30	37	27	3,048	—	—	16	223	134
Corresponding period in ...									
1939	21	26	1	45	1	1	22	188	146
1938	36	36	7	1,106	—	—	29	90	99
1937	47	54	24	4,710	2	2	11	30	9
Total 1st January to 30th Nov. 1940	527	632	76	12,070	15	30	179	4,673	3,297
Corresponding period in									
1939	666	757	83	10,942	33	73	246	2,963	2,247
1938	752	1,145	176	23,367	45	75	184	831	674
1937	655	788	100	18,711	106	145	217	940	560

Note.—The figures for the current year are approximate only. **§ Excluding outbreaks in Army Horses.**

Tuberculosis (Attested Herds) Schemes

The number of Attested Herds, *i.e.* herds officially certified as free from tuberculosis, as at 30th November, 1940, was as follows:— England 3,820 ... Wales 9,295 ... Scotland 3,179 ... Total (Great Britain) 16,294